

Molarity Practice: Pre-AP

Use your knowledge of the concentration [Molarity] to solve the following problems. **You will need to complete it on a separate sheet of paper. Show all work including units or no credit may be given.**

Fill out the missing data in the table below by using the given information:

Compound	Molar Mass (g/mol)	Mass of Solute (g)	Moles of Solute	Volume of Solution (L)	Molarity (mol/L)
HCl	36.5	26.0		0.600	
H ₃ PO ₄	60.0	100		1.2	
CaO	56.0	48.0		0.25	
CuNH ₄ (NO ₃) ₃		125			0.375
KMnO ₄			1.2		2.6
K ₂ Cr ₂ O ₇	294	375		0.8	
KOH			0.45		0.82

Complete each of the problems below

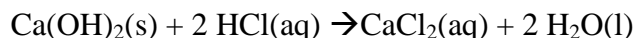
- Sea water contains roughly 28.0g of NaCl per liter. What is the molarity of sodium chloride in sea water?
- What weight (in grams) of H₂SO₄ would be needed to make 750.0 mL of 2.00 M solution?
- What volume (in mL) of 12.0 M HCl is needed to contain 3.00 moles of HCl?
- Determine the mass (g) of solute to prepare these solutions:
 - 0.289L of a 0.00300 M Cu(NO₃)₂ solution.
 - 16.00 mL of a 5.90M Pb(NO₃)₂ solution.
 - 508 mL of a 2.75 M NaF solution.
 - 6.20 L of a 3.76-molar Na₂O solution.
- Determine the final volume (L) of these solutions:
 - 4.67 moles of Li₂SO₃ dissolved to make a 3.89 M solution.
 - 4.907 moles of Al₂O₃ to make a 0.500 M solution.
 - 0.783g of Na₂CO₃ to make a 0.348 M solution.
 - 8.97g of (NH₄)₂CO₃ to make a 0.250-molar solution.
- Problem 7-15 are stiochiometry based; remember that you need moles and volume to get molarity.
- If 5.0g of sodium is added to water and the resulting solution of sodium hydroxide has a volume of 0.1L what is the molarity of the Sodium hydroxide solution?

$$2\text{Na(s)} + 2\text{H}_2\text{O(l)} \rightarrow 1\text{H}_2\text{(g)} + 2\text{NaOH(aq)}$$

8. $\text{Mg(OH)}_2(\text{s}) + 2 \text{HBr}(\text{aq}) \rightarrow \text{MgBr}_2(\text{aq}) + 2 \text{H}_2\text{O}(\text{l})$
a) How many milliliters of 0.225 M HBr would be needed to react completely with 3.26 grams of magnesium hydroxide?

b) If 31.6 grams of magnesium hydroxide is combined with 68.0 mL of 0.725 M HBr, which is the limiting reagent? How many grams of magnesium bromide would be formed?

9. How many litres of 0.100 M HCl would be required to react completely with 5.00 grams of calcium hydroxide?



10. Your teacher asks you to prepare 500 mL of a 2.75 molar solution of NaCl for an upcoming laboratory experiment. Write a step-by-step procedure describing how you would carry out this task.

Molality Practice

Use your knowledge of the molality to solve the following problems. **You will need to complete it on a separate sheet of paper. Show all work including units or no credit may be given.**

$$m = \frac{\text{mol}_{\text{ solute}}}{\text{kg}_{\text{ solvent}}}$$

11. What is the difference between solute and solvent?

12. How does molality (*m*) differ from molarity (M)?

13. 45.7 g of magnesium chloride is dissolved in 2.40 kg of water.

a) Write the correct formula for magnesium chloride.

b) What is the **molality (*m*)** of the solution?

14. Calculate the molality of each of the following solutions:

a. 3.50 g of H_2SO_4 in 12.0 g of water

b. 170.0 g of ethyl alcohol ($\text{C}_2\text{H}_6\text{O}$) in 650.0 g of water

c. 2.60 g of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) in 110.0 g of water

15. Calculate the number of grams of solute necessary to prepare the following aqueous solutions:

a. 400.0 g of a 0.400 m solution of ethyl alcohol

b. 700.0 g of 0.500 m solution of sulfuric acid (H_2SO_4)

c. 425 g of a 3.30 m solution of ethylene glycol

16. Calculate the number of grams of water that must be added to

a. 65.0 g of glucose in the preparation of a 2.00 m solution

b. 95.0 g of sugar in the preparation of an 8.00 m solution

c. 4.10 mol of sulfuric acid in the preparation of a 12.0 m solution.

Key

Compound	Molar Mass (g/mol)	Mass of Solute (g)	Moles of Solute	Volume of Solution (L)	Molarity (mol/L)
HCl	36.5	26.0	0.71	0.600	1.187
H ₃ PO ₄	60.0	100.	1.67	1.2	1.4
CaO	56.0	48.0	0.857	0.25	3.43
CuNH ₄ (NO ₃) ₃	268	125	0.466	1.24	0.375
KMnO ₄	158	189.6	1.2	0.46	2.6
K ₂ Cr ₂ O ₇	294	375	1.28	0.8	1.59
KOH	56	25.6	0.45	0.549	0.82

- 0.483M
- 147g
- 250mL
- 0.163g
 - 32.62g
 - 58.7g
 - 1445g
- 1.2L
 - 9.8L
 - 0.021
 - 0.374
- 2.17M
- 250ml
 - HBr
- 0.0135L

10. Your teacher asks you to prepare 500 mL of a 2.75 molar solution of NaCl for an upcoming laboratory experiment. Write a step-by-step procedure describing how you would carry out this task.

Molality Practice

Use your knowledge of the molality to solve the following problems. **You will need to complete it on a separate sheet of paper. Show all work including units or no credit may be given.**

$$m = \text{mol}_{\text{solute}} / \text{kg}_{\text{solvent}}$$

- What is the difference between solute and solvent?
- How does molality (m) differ from molarity (M)?
- 45.7 g of magnesium chloride is dissolved in 2.40 kg of water.
 - Write the correct formula for magnesium chloride.
 - What is the **molality** (m) of the solution?
- Calculate the molality of each of the following solutions:
 - 3.50 g of H₂SO₄ in 12.0 g of water

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